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EXAMINER

CULBERT, ROBERTS P

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1763

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Paper No. 12

Application Number: 09/929,849
Filing Date: August 14, 2001
Appelants: HART ET AL.

David E. LaRose
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 6/30/03.

(1) ***Real Party in Interest***

A statement identifying the real party in interest is contained in the brief.

(2) ***Related Appeals and Interferences***

A statement identifying the related appeals and interferences, which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) ***Status of Claims***

The statement of the status of the claims contained in the brief is correct.

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(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

Appellant's brief includes a statement that Group I (claims 6-19), Group II (claim 4), Group III (claims 2-3, 5, and 7), Group IV (claims 13, 17-18, and 20) and Group V (claims 14-16) do not stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

5,454,928	ROGERS	10-1995
5,105,588	VERLEY	4-1992
6,045,214	MURTHY	4-2000
4,950,583	BREWER	8-1990
5,719,605	ANDERSON	2-1998
5,286,703	WACHI	2-1994

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4,009,113	GREEN	2-1977
5,677,063	KAMIYAMA	10-1997

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 6 and 19 and are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,454,928 to Rogers in view of U.S. Patent 5,105,588 to Verley, and U.S. Patent 6,045,214 to Murthy et al.

Rogers teaches a method for forming vias completely through a semiconductor circuit substrate using laser drilling. Before the step of laser drilling, Rogers teaches the application of a water-soluble polymer layer to protect the surface from debris (Column 2, Lines 52-55). The coating is removed along with the debris after the drilling step (Column 2, Lines 59-61).

Rogers does not teach the use of grit blasting to form the vias through the semiconductor substrate or the use of the vias as ink channels.

Verley does teach that ink channels may be preferably formed in a silicon semiconductor substrate using grit blasting. (Col. 1, Lines 15-40). It would have been obvious to one of ordinary skill in the art at the time of invention to use grit blasting to form ink channels as shown by Verley.

One of ordinary skill in the art would have been motivated to use the alternative method at the time of invention in order to avoid the problems, such as reduced economy and efficiency, associated with laser and ultrasonic drilling as clearly stated by Verley (Col. 1, Lines 30-31).

One of ordinary skill in the art would have been motivated to use the protective layer with either drilling technique because both methods of drilling inherently form debris from the ablated material that may impact the device surface.

Rogers does not teach the use of a photoresist or a silane adhesion promoter to provide nozzle plate attachment.

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Murthy does teach that it is known in the art of making ink-jet printheads to coat the semiconductor substrate (12) with photo-curable epoxy resin (Col 4, Lines 1-5). It would have been obvious to one of ordinary skill in the art at the time of invention to use the conventional photoresist layer (same as permanent non-water soluble layer) as shown by Murthy.

One of ordinary skill in the art would have been motivated to use the photoresist layer at the time of invention in order to enhance adhesion between the nozzle plate and substrate as stated by Murthy (Col. 4, Lines 3-4).

One of ordinary skill in the art would have been motivated to apply the water soluble protective layer onto the permanent non-water soluble layer because the permanent non-water soluble layer is a permanent part of the finished device as shown by Murthy. It would therefore have been obvious to apply the protective layer onto the permanent layer in order to form the ink-jet supply channels with aligned flow features in the conventional manner (See Murthy Fig. 1) while permitting the adhesive attachment of the nozzle plates after the formation of the ink channels using grit blasting as shown in Verley and removal of the temporary water soluble protective layer as shown in Rogers.

Regarding Claim 6, Verley teaches the use of aluminum oxide and silicon carbide for grit blasting vias in a silicon ink-jet substrate (Column 1, Lines 46-47). It would have been obvious to one of ordinary skill in the art at the time of invention to use the particles suggested by Verley in order to suitably form vias in the silicon substrate using grit blasting.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rogers in view of, Verley and Murthy and in further view of U.S. Patent 4,950,583 to Brewer et al. As applied above, Rogers, Verley and Murthy disclose the method of the invention substantially as claimed, but do not show the use of a silane adhesion promoter *before* the photoresist is applied. Brewer teaches the use of silane adhesion promoters in the application of a photoresist to a silicon substrate (Column 1, Lines 36-41). It would have been obvious to one of ordinary skill in the art at the time of invention to use the adhesion promoter described in Brewer.

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One of ordinary skill in the art would have been motivated to use the silane adhesion promoter in order to increase the adhesion of the photoresist to the substrate.

Claims 2,3,5 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rogers, in view of Verley, and Murthy and in further view of U.S. Patent 4,009,113 to Green et al., U.S Patent 5,286,703 to Wachi et al. and German Patent DE 4123900 to Rosen.

As applied above, Rogers, Verley, Murthy and Kamiyama disclose the method of the invention substantially as claimed, but Rogers does not show the use of a polyacrylamide layer. Rogers does teach the use of a water-soluble polymer as a temporary protective layer. Green teaches the use of polyacrylamide in a temporary protective coating (Col. 4, Lines 20-32). Polyacrylamide is known to be a common water-soluble polymer used for protective layers. Evidence of this fact is provided in Wachi (Column 27, Lines 55-68). Motivation to use a protective polyacrylamide layer is also provided in the Rosen reference (See Abstract). It would have been obvious to one of ordinary skill in the art at the time of invention to use one of the water-soluble polymers of Rosen in order to suitably form a temporary protective coating that prevents debris contact as stated in Rosen.

One of ordinary skill in the art at the time of invention would have been motivated to use any water-soluble polymer known in the art that meets the stated requirements. There are a limited number of polymers that have the desired characteristics for the application. The polymer must have a linear or branched poly-alkane backbone with a sufficient number of hydrophilic groups to make the polymer soluble in aqueous phase, a tensile strength that is sufficient to resist mechanical degradation, a molecular weight that permits a melting point between approximately 40 and 90 ° C and a relatively low commercial production cost per pound to permit economical manufacturing. Note that the lower range limit for melting prevents degradation at operating temperatures and the upper range limit prevents damage to the other parts of the substrate at high temperatures.

The selection of a known material based on its suitability for its intended purpose supports a *prima facie* obviousness determination. See MPEP 2144.07.

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Claims 13, 17, 18, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rogers in view of Verley and Murthy, and in further view of U.S. Patent 5,677,063 to Kamiyama et al., U.S. Patent 5,719,605 to Anderson et al.

As applied above, Rogers in view of Verley and Murthy disclose the method of the invention substantially as claimed, but do not teach spin coating the adhesive layer or the protective layer.

Kamiyama teaches that spin coating, blade coating and roll coating are known methods for the purpose of forming a thin layer of polyacrylamide (Column 27 Lines 15-21). It would have been obvious to one of ordinary skill in the art at the time of invention to use spin coating in order to suitably deposit a fluid polymer layer on a substrate.

The finishing steps of attaching nozzle plates, dicing the wafer, connecting TAB circuits, and connecting the nozzle plate/chip assemblies to printhead bodies to form printheads, are well-known in the art of forming ink jet printheads as shown in Anderson (See for example, Figures 2 & 3). It would have been obvious to one of ordinary skill in the art at the time of invention to apply the same finishing steps in order to complete the printhead assembly in the well-known manner.

Anderson also teaches that it is known in the art of forming ink jet print heads to form the vias using grit blasting or laser cutting (Col. 5, Lines 15-16). Additionally Anderson teaches that it is conventional to form the channels (52) in conjunction with the nozzle plate (30) and spacer or insulating film (56). See (Col. 5, lines 15-28).

Regarding Claims 17 and 18, Rogers does not teach the thickness of the adhesive and protective layers.

The ranges for layer thickness as recited in claims 17 and 18 would have been obvious to one of ordinary skill in the art as the layer must only be thick enough to provide adequate adhesion for the first layer, and adequate protection for the second layer.

Regarding the step of grit blasting, it would have been obvious to one of ordinary skill in the art at the time of invention to grit blast the vias from the side of the wafer opposite the device layer.

One of ordinary skill in the art would have been motivated to perform the ablation in this manner in order to prevent the particles from damaging the components.

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Furthermore, the background of the invention clearly states that the grit blasting is performed typically from the side of the wafer opposite the active surface.

Regarding Claim 13, as recited above, Verley teaches the use of aluminum oxide and silicon carbide for grit blasting vias in a silicon ink-jet substrate (Column 1, Lines 46-47). It would have been obvious to one of ordinary skill in the art at the time of invention to use the particles suggested by Verley in order to suitably form vias in the silicon substrate using grit blasting.

Claims 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rogers, in view of Verley, Murthy, and Kamiyama and in further view of U.S. Patent 4,009,113 to Green et al., U.S. Patent 5,286,703 to Wachi et al. and German Patent DE 4123900 to Rosen.

As applied above, Rogers, Verley, Murthy and Kamiyama disclose the method of the invention substantially as claimed, but Rogers does not show the use of a polyacrylamide layer. Rogers does teach the use of a water-soluble polymer as a temporary protective layer. Green teaches the use of polyacrylamide in a temporary protective coating (Col. 4, Lines 20-32). Furthermore, Polyacrylamide is known to be a common water-soluble polymer used for protective layers. Evidence of this fact is provided in Wachi (Column 27, Lines 55-68). Motivation to use a protective polyacrylamide layer is also provided in the Rosen reference (See Abstract). It would have been obvious to one of ordinary skill in the art at the time of invention to use one of the water-soluble polymers of Rosen in order to suitably form a temporary protective coating that prevents debris contact as stated in Rosen.

One of ordinary skill in the art at the time of invention would have been motivated to use any water-soluble polymer known in the art that meets the requirements. There are a limited number of polymers that have the desired characteristics for the application. The polymer must have a linear or branched poly-alkane backbone with a sufficient number of hydrophilic groups to make the polymer soluble in aqueous phase, a tensile strength that is sufficient to resist mechanical degradation, a molecular weight that permits a melting point between approximately 40 and 90 ° C and a relatively low commercial production cost per pound to permit economical manufacturing. Note that the lower range

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limit for melting prevents degradation at operating temperatures and the upper range limit prevents damage to the other parts of the substrate at high temperatures.

The selection of a known material based on its suitability for its intended purpose supports a *prima facie* obviousness determination. See MPEP 2144.07.

Regarding Claim 16, as recited above, Verley teaches the use of aluminum oxide and silicon carbide for grit blasting vias in a silicon ink-jet substrate (Column 1, Lines 46-47). It would have been obvious to one of ordinary skill in the art at the time of invention to use the particles suggested by Verley in order to suitably form vias in the silicon substrate using grit blasting.

(11) Response to Argument

1. Applicant has argued that the rejection of claims 6 and 19 over the '928 patent in view of the '214 patent and the '588 patent is in error. (Page 6 of Appellants' Brief)

The argument is not persuasive because the references cited provide all of the elements of the claimed invention as recited in the rejections above.

Verley teaches that it is known to form vias in a substrate using grit blasting or laser drilling. Murthy teaches that it is conventional to form a permanent non-water soluble layer on the substrate prior to nozzle plate attachment and shows that ink slots are formed through this layer. Rogers shows that it is known to coat a substrate prior to drilling using a removable water-soluble polymer coating in order to protect the surface from debris. The debris may be then removed along with the coating.

The Murthy reference is cited in the rejections above to show that it is conventional to form a permanent non-water soluble layer on the substrate prior to nozzle plate attachment (Col. 4 Lines 1-5). The other portions of the Murthy reference are relevant in that they show that it is known in the art of making flow features for ink-jet printheads to use water soluble protective layers to protect a substrate from ablated debris. (Murthy; Col. 6, Lines 35-37)

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Applicant has argued that the '928 patent to Rogers is deficient in that it does not mention the permanent non-water soluble layer or how grit blasting is used to form the holes. (Page 6-7 of Appellants Brief) The argument is not persuasive because the Verley Patent shows the claimed features.

Applicant has argued that the '588 patent to Verley is deficient in that it does not mention the permanent non-water soluble layer or the water-soluble protective layer. (Page 7-8 of Appellants Brief) The argument is not persuasive because the Rogers and Murthy Patents show the claimed features.

Applicant has argued that the '214 patent to Murthy is deficient in that it protective layer is applied to the nozzle plate and uses a B-stageable thermal curable material. (Page 7 of Appellants Brief) However the argument is moot in view of the new grounds of rejection.

Applicant has argued that the '928 patent is directed to filling holes rather than forming holes (Page 8 of Appellants' Brief). The argument is not persuasive because the reference is clearly directed at both forming and filling holes. The filing of the holes is obviously not relevant to applicant's claimed invention.

Applicant has argued that the '214 Patent to Murthy is directed to ablating a nozzle plate that does not contain a device surface (Page 8 of Appellants Brief). However, the argument is moot in view of the new grounds of rejection above.

2. Applicant has argued that the rejection of claim 4 over the '928 patent in view of the '214 patent and the '588 patent and in further view of the '583 patent is in error. (Page 9 of Appellants Brief)

The argument is not persuasive because the '583 patent provides the claim limitations recited in claim 4, as well as a motivation for combination with the other references. The '583 Patent to Brewer teaches that it is conventional in the art to use a silane adhesion promoter to enhance the adhesion of a photoresist to a silicon substrate as stated in the rejection above. The combination with the Murthy reference is natural, as Murthy shows the application of a photoresist to a semiconductor substrate.

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3. Applicant has argued that the rejection of claims 2-3,5,and 7 over the '928 patent in view of the '214 patent and the '588 patent and in further view of the '113 patent the '703 patent and the '900 DE Patent is in error. (Page 11-12 of Appellants Brief)

The argument is not persuasive because the limitations of the claims are met by the cited references. The '113 patent to Green, the '703 patent to Wachi and the '900 DE Patent are cited only to show that polyacrylamide is a known water-soluble protective layer used to in the semiconductor device art to protect surfaces such as silicon wafers (Rosen).

Applicant has argued (Page 12 of Appellants Brief) that the 900 DE patent actually leads away from the use of a removable water-soluble polymer by saying that the layer "cannot be removed as a film". Although the layer cannot be removed as a film, it is also clearly stated in the attached translation that the layer "is water soluble and thus easily removable".

4. Applicant has argued that the rejection of claims 13, 17-18, and 20 over the '928 patent in view of the '214 patent and the '588 patent and in further view of the '063 patent and the '605 Patent is in error. (Page 13 of Appellants Brief)

The argument is not persuasive because the limitations of the claims are met by the cited references.

Kamiyama teaches that spin coating is a suitable method for applying a water-soluble polymer to a flat substrate. Applicant has argued, "However, the spin coating process requires that an insulating layer formed from certain organic materials be applied to the recording medium using a water soluble carrier." The argument is not clear to the examiner.

Anderson teaches that the finishing steps of attaching nozzle plates, dicing the wafer, connecting TAB circuits, and connecting the nozzle plate/chip assemblies to printhead bodies to form printheads, are old and well-known in the art of forming ink jet printheads.

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5. Applicant has argued that the rejection of claims 14-16 over the '928 patent in view of the '214 patent, the '588 patent, and the '063 patent and in further view of the '703 patent and the '900 DE Patent is in error. (Page 14-15 of Appellants Brief)

The argument is not persuasive because the limitations of the claims are met by the cited references. Rogers teaches the use of a water-soluble polymer as a temporary protective layer. Green teaches the use of polyacrylamide in a temporary protective coating layer. Wachi further teaches that Polyacrylamide is known to be a common water-soluble polymer used for protective layers. Motivation to use a protective polyacrylamide layer is also provided in the Rosen reference. It would have been obvious to one of ordinary skill in the art at the time of invention to use one of the water-soluble polymers of Rosen in order to suitably form a temporary protective coating that prevents debris contact as stated.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

For these reasons, it is believed that the new rejections presented above should be sustained.

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Respectfully submitted,

Examiner Roberts Culbert


July 14, 2003

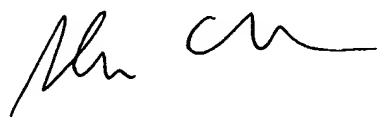
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